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PROCEEDINGS OF THE JOINT MEETING OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION AND THE DIVISION OF PSYCHOLOGY OF SECTION H OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, SAN FRANCISCO, AUGUST 3, 4, AND 5, 1915.

REPORT OF THE SECRETARY OF COMMITTEE ON PROGRAM, J. E. COOVER, STANFORD UNIVERSITY.

A joint meeting of the American Psychological Association and the Division of Psychology of Section H of the American Association for the Advancement of Science was held at San Francisco, August 3, 4, and 5, 1915. Sessions were held in the Philosophy Building, University of California, Berkeley, on August 3 and 5; and in the Department of Psychology, Stanford University, August 4. All were well attended.

The very successful series of meetings opened in the Philosophy Building, University of California, with the morning session of August 3, in affiliation with Section L of the American Association for the Advancement of Science, and the American Association for the Study of the Feeble-minded, at which Professor Cubberley, as vice-president of Section L, gave a brief address of welcome and turned the meeting over to Professor Martin, vice-president of Section H.

An innovation which aided in interpreting and discussing the papers was the introduction of very brief abstracts in the printed program.

A dinner and smoker was held at the Castilian Restaurant, in San Francisco, on the evening of August 4, at which the vice-president of Section H gave an address.

ABSTRACTS OF PAPERS

An Experimental Study of the Subconscious. Address of the vice-president of Section H. LILLIEN J. MARTIN, Stanford University.

In making this study the image method was employed. That is, the observer was instructed to sit in a relaxed position and let an image arise of itself; he was not only not to arouse the image but he was not to know its content until it had arisen, and only those images were noted where the instructions had been entirely complied with. In the other half of the experiments the observer was directed to decide on the particular image he wished to have arise and then to arouse it. The two kinds of images were compared with a view to getting information regarding the subconscious and its relation to the conscious.

1. Results show that the subconscious content (*a*) responds more quickly, in some persons, to the task set than does the conscious; (*b*) differs in richness of content in different individuals; (*c*) has in part remained as originally grouped, in part been more or less broken up, and even recombined into complicated and appropriate groups; (*d*) is evidently not all on the same stratum of consciousness for some of it arises much more spontaneously and quickly and has a different content; (*e*) is sometimes the point of departure of the willed images, which gives it great importance in daily life—advantageous when in the direction of the work in hand; disadvantageous when not; (*f*) is not materially different from the conscious content—which does not support Binet's or Myers' theory but does support Prince's theory that what is under the threshold is an expression of the observer's previous experience.

2. Of interest to General Psychology: Results show (*a*) the necessity for distinguishing between spontaneous and voluntary images; (*b*) vacillation of the attention may be due to a flood of subconscious images or ideas; the genius may get on faster by letting himself go; the student in a field foreign to his natural thinking must take himself in hand or fail; (*c*) new methods are required for quantitative memory investigation; (*d*) memory experiments can be used to measure the strength of the will only when memory is voluntary.

3. Of interest to Pedagogy: Results show that it is possible to educate and enrich the subconscious, and lead one to question whether too much emphasis is not at times placed on the employment of the will in connection with intellectual work.

4. The image method is comparable if not superior to the automatic writing, automatic speaking, pathological, or psycho-analytic methods, for the study of the subconscious.

Studies in Educational Psychology and Mental Tests

The Stanford Revision of the Binet Scale. Lewis M. Terman, Stanford University.

On the basis of the results from 1700 non-selected normal children and 400 adults, to whom the 1908 Binet and 25 new tests were given, a tentative revision of the scale was made and the mental ages were calculated for the children of each age group. If the median mental age thus found was at any part in the scale too high or too low it then became necessary to shift certain tests or to change the standard of scoring until the median mental age fell at or very near the median physical age. In this way successive drafts of the revision were made until a scale was found which was equally accurate at all ages. The final arrangement includes 6 tests in each year from III to X, 8 in XII, 6 in XIV, 6 in "Average Adult," and 6 in "Superior Adult." By this scale ordinarily intelligent adults, little educated, actually test up to what is called the "average adult" level, while persons whose intelligence is known from other sources to be superior are found to test, regardless of education, well up to the "superior adult" level. It is believed that the extension and correction of the scale at the upper end will prove especially valuable in the examination of high grade defectives and borderland cases.

Analysis of the data from 1,000 non-selected school children brought out the following facts: (1) That the distribution of intelligence at each age closely approximates the normal curve. (2) That the I Q method of indicating intellectual status holds approximately for the ages 5 to 14, at least. (3) That sex differences in intelligence, and in the nature of its distribution, are negligible. (4) That the rather high positive correlation between mental age and social status is attributable in the main to real differences in endowment. (5) That there is a high positive correlation between mental age and school success; also between mental age and the teacher's estimate of intelligence. (6) That the best method of determining the validity of a test is to measure it against the rest of the scale as a whole.

A New Scale of Mental and Physical Measurements for Adolescents, and Some of its Uses. HELEN THOMPSON WOOLLEY, The Vocation Bureau, Cincinnati, Ohio.

These scales embody the idea that an average of a group of mental tests gives a more significant measure of ability than any one test. They are based on tests of 750 working children at 14 years, and 680 of these same children at 15 years. Practically the same series of tests has been given to the same group at 16 and 17 and 18 years.

The plan of the scales: Each phase of each test is summed up by the percentiles. Every individual is then given a rank from one to ten on each phase according to the percentile in which his results fall. His percentile ranks are then averaged separately for the sets of physical and mental tests. These percentile averages for each sex at each age are again arranged in ten percentiles to form a general scale. New individuals can now be given the series of tests, and their average percentile rank can be located on the general scale.

The scale's significance: First, a given individual does not vary widely on the scale from year to year; second, this ranking correlates closely with school grade completed; third, individuals ranking high in tests but retarded in school have unfavorable social surroundings, and vice versa.

Uses of the Scales. (1) Comparison of groups. Girls of these ages are slightly superior to boys in most of the mental tests, but there are more exceptionally poor girls, and more exceptionally good boys. We find that public are superior to parochial school children in physical and mental development, the boys' differences being large and consistent; the girls', small. (2) The fixing of more adequate standards for determination of high grade mental deficiency. The preliminary results attained from giving the Yerkes point scale to our 18-year-old group indicate that about one-fourth fall below the limit set for normal adults. (3) The relation between manual and mental ability and its educational application. The results show a small positive correlation, but many whose manual ability is greater than their mental and vice versa. An early determination of these differences would have far-reaching educational significance. (4) An analysis of factors making for industrial success or failure. Records of mental ability, manual skill, and social surroundings make possible estimates of their relative importance. During the first two years of industrial

life there is very little relation between mental ability and earning capacity.

A Graded Series of Geometrical Puzzles. GRACE HELEN KENT, Sterling, Mass.

This series of puzzles is offered as one unit of a group of tests to be used for measuring the capabilities of defective children, especially children who have little or no knowledge of the language in which the test is given. Each of the units is to conform to the following requirements: (1) The test is to call for a motor reaction from the subject, rather than for a verbal response, but is to be essentially mental, not motor. (2) The test is to require the minimum of verbal explanation on the part of the examiner, so that the instructions may be given through an interpreter. (3) The test must possess sufficient intrinsic interest to command the spontaneous coöperation of the subject. (4) Each test must be capable of being graded, so as to be adaptable to the ability of any subject. The method employed must admit of being varied widely in difficulty without affecting the essential nature of the test. (5) Each test must admit of being scored by a system which will give partial credit for partial success. The results are to be scored either by a sliding scale or by empirically determined steps.

The unit here presented includes twenty puzzles, each of which when solved forms a square. The puzzles are arranged approximately according to their difficulty, as determined by the time records of a small group of normal subjects. Each subject tested is to be permitted to solve as many of the puzzles as he can, two minutes being the time allowed for each puzzle. This test may be used to supplement verbal tests. There will be no attempt at present to standardize it on a large scale. It is necessary first to find many other test methods which can be used as units of the group, and the different units must be sufficiently varied to call into play widely different types of mental activity.

Tests for Prospective Students of Stenography. L. W. FIKE, University of California.

A series of tests has been devised at the psychological laboratory, University of California, for the purpose of determining beforehand whether or not a student possesses the mental endowments which are essential in a stenographer. Tests are made of ability to remember, to carry out oral and written directions, to

learn to translate into a code, to concentrate the attention, to perform two operations at once, and of the other fundamental mental traits. It is hoped that the tests will make it possible to eliminate students who will never be able to succeed as stenographers before they have wasted valuable time in studying the subject.

Various Degrees of Success in Public School Training of Mental Defectives. VINNIE C. HICKS, Clinical Psychologist, Board of Education, Oakland.

Ability to support oneself independently and honestly in adult life is assumed as a criterion of successful training of mental defectives by public schools. Such success depends upon three prime factors: (1) Level of mental ability; (2) Moral type; (3) Environment. (1) The level of mental ability must be above that of idiots and imbeciles, for whom the school cannot provide the requisite facilities for large muscle work and house work, or the constant supervision required for training in social and personal habits. Morons and borderline cases admit of education up to the point of self-support, the best results attending those able to learn to change money and attain some manual ability. (2) Except for the moral imbecile, the defectives respond to special training by establishing right ideas and strengthening the will to conform to them. (3) The environment must not counteract the work of the school.

Public school training amounts to little if given in regular classes. It must be under expert management and in small special class groups. For the benefit of the next generation, sterilization should be increased and marriage decreased, for which provisions the school can assist, in reconciling the individual to them.

Results of Tests with Specific Cases with Emphasis on the Study of the Delinquent Type. GRACE M. FERNALD, Los Angeles State Normal School, and the California School for Girls.

One hundred girls, committed to the California School for Girls, were examined during the last year. Each girl's mental age was determined, first by the Binet-Simon (1911 revision) scale, and, in the last 57 cases, by the Stanford revision as well. Each girl was then tested for special characteristics.

A series graded in complexity, was worked out for each type of test, as perception, memory, imagination, reasoning, etc. For example, three forms of substitution tests were used, four forms

of the code and four types of puzzle box. Considerable work has been done toward standardizing these tests in the Los Angeles Schools, and by follow-up work in individual delinquent cases.

Certain of the tests in both the Binet-Simon and Stanford revision seem particularly unadapted to those cases where the family and school history shows the most unsatisfactory conditions. The definition of "charity," "justice" and "goodness," the distinction between abstract terms, and the differences between president and king were not given in many cases when the child would otherwise have graded up to age, and did such difficult tests as the code and geometrical figures. The Stanford vocabulary was done through the low adult by only four girls in the school. This suggests that other tests, equally difficult but less dependent on formal education, should be substituted for those just mentioned.

We found it entirely possible to run a child through the special characteristic tests and then to check off, on the Binet-Simon or any other scale, what he is able to do with the various tests in that scale. Space allows only the barest suggestion of our results with these tests.

In twenty-four cases girls who possessed excellent memories were hopelessly poor in all their reactions to any tests involving reasoning. In eleven cases girls who were distinctly good in reasoning capacity had only a fair memory span. The girls were uniformly poor in powers of concentration, easily fatigued, and with very few exceptions emotionally unstable. A study of family histories shows that only 13 per cent. of the girls come from homes where the parents live together, and in only six per cent. of these cases is the home in any sense satisfactory. The two most noticeable facts about the school history are, that eleven per cent. of the girls have reached high school, and nineteen per cent. of the defectives were allowed to go above sixth grade though they were unable to do third grade work.

The Result of Mental Tests upon Dependent and Delinquent Children in San Francisco. OLGA L. BRIDGMAN, University of California.

Psychological Tests of Reed College Students. ELEANOR HARRIS ROWLAND, Reed College.

A series of 20 tests was given to 249 students in Reed College. The series included tests in attention, memory, suggestion, logical judgment, association, and other processes. Comparative lists of

the students were made both on the basis of their efficiency in the separate tests, and in certain of the tests grouped together, and their place in these test-lists correlated by Yule's formula with their place in lists compiled from the marks given by instructors in their various courses.

A fairly high correlation figure was found for certain tests. The best figure was for a combination of a cancellation, association, memory, and logical judgment test. Correlations were also made on a sex basis, with fairly high figures in certain tests.

Evaluation of Reactions in an Association Test Designed for the Purpose of Higher Mental Measurements. A. J. ROSANOFF, Kings Park State Hospital, N. Y.

Our general plan for the development of standards in a higher scale of mental measurement has already been described. The question before us now is that of a proper objective evaluation of the reactions to the stimulus words obtained in the test; more particularly, can frequency, here as elsewhere, be accepted as a measure of value?

In response to the stimulus word *refraction* 500 subjects of at least full collegiate education and 100 subjects of not more than high school education, gave the following common reactions, here reproduced together with their respective group values expressed in percentages of frequency: light, 35.2, 5.0; glass, 7.0, 0; reflection, 6.6, 1.0; physics, 6.4, 0; eye, 3.4, 0; lens, 3.4, 0; eyes, 3.2, 0; index, 3.0, 0; refractory, 0.8, 6.0; fraction, 0.4, 4.0; reflex, 0.4, 2.0; deviation, 0.2, 2.0; refract, 0, 5.0; reaction, 0, 4.0; fractions, 0, 3.0; part, 0, 3.0; arithmetic, 0, 2.0; break, 0, 2.0; decimal, 0, 2.0; from, 0, 2.0; numbers, 0, 2.0; retract, 0, 2.0; *failure of reaction*, 0.4, 20.0.

Even more striking differences are indicated in the kind of individual reactions. First group examples are, atmosphere, high, industry, minerals, myopia; second group examples, adding, again, back, bad, biceps. Aside from the obvious difference in quality of the individual responses given by the two groups of subjects, the fact of the far greater number of them given by the second group, 28 per cent. as compared with 12 per cent. for the first group, is of significance, especially in view of the circumstance that there were 0.4 per cent. of instances of failure of reaction in the first group and no less than 20 per cent. in the second. The values of reactions would be erroneously indicated by frequency tables constructed on the basis of material obtained from subjects selected at random;

but a special selection of subjects according to education would seem to make possible the construction of standards that could serve for practical purposes.

The Measurement of Ability in English Grammar. DANIEL STARCH, University of Wisconsin.

Age Norms of Psycho-Motor Capacity. J. E. WALLACE WALLIN, Psycho-Educational Clinic, St. Louis, Mo.

Of the numerous methods available for estimating mental capacity none compares in accuracy with the method of controlled psychological testing and mental evaluation by means of experimentally established normal age norms. Few single psycho-diagnostic tests are superior to tests of psycho-motor capacity. Psycho-motor capacity can be tested by form-boards which present a complex and novel problem which requires for its solution motor ability plus the power of sensory discrimination, recognition and association, and the retention of a series of formed associations.

The following are a few of the conclusions reached from an analysis of experimental work on over 4,000 bright, average, dull, feeble-minded and epileptic children and adults, based on one of the best form-boards for testing psycho-motor development (the modernized Seguinian): (1) It is possible to establish not only yearly but also half-yearly normal norms for this test for the ages investigated, 2 to 17. However, semi-yearly norms seem to be sufficiently accurate up to about the age of 8, yearly norms from 8 to about 12, and bi-yearly norms from 12 to 17 or beyond. (2) The performance varies with grade of intelligence: the bright surpass the average, the average the dull, the dull the feeble-minded, the morons the imbeciles. Epileptics are subject to pronounced psycho-motor retardation. (3) Accordingly, normal norms can only be secured by testing approximately normal children. Seventy-five per cent. of the writer's normal group was classified as "average," and about one-half each of the remainder as "dull" and "bright." The character of the groups tested probably partially explains the large differences between the normal norms of three investigators. (4) The boys' performance is superior to the girls'. (5) Satisfactory age scales of mental development can be constructed by assembling a considerable number of tests of various functions for which semi-yearly, yearly or bi-yearly norms have been established, as in the case of this form-board.

Some Aspects of the Problems of Sequence of Subjects in Beginner's Psychology. L. W. SACKETT, University of Texas.

STUDIES IN EXPERIMENTAL PSYCHOLOGY

Experiments on Memory in Progress in the Laboratory of the University of Michigan. W. B. PILLSBURY, University of Michigan.

Up to the present most investigations on memory have used the simplest materials and have dealt primarily with rote memory. Mrs. Austin and Miss Buck have been using material of the kind employed in ordinary instruction and have used the number of ideas retained as a test of memory rather than the number of words or non-sense syllables.

It has been found that grading can be carried on satisfactorily for ideas and that the results check almost as well as for nonsense material. Miss Buck attempted to measure the time-relations between associations affected and effectors in retroactive inhibition. The results were consistent but showed no evidence of the inhibition. In this they agreed with De Camp's work with nonsense syllables.

Mrs. Austin applied the method to a study of the influence of divided repetitions, and the results confirmed the work of Jost and others with nonsense material. It was also found that the effect of dividing the repetitions was greater when the tests were made after an interval of two weeks than when they were made the next day.

In both series of investigations the results indicate that the grading can be carried out consistently if the ideas be made the unit of measurement. It will be possible to check the results obtained with nonsense material for the methods and materials that adults have occasion to remember.

Theories of Recognition. FRANK ANGELL, Stanford University.

Large number and diversity of theories of recognition probably owing to the complexity of the processes of recognition and to the tendency to cover all the phenomena involved with a single principle of explanation.

Danger in relying on evidence derived from pathological sources, and particularly in cases of depersonalization and agnosia where the extent of disturbance in perceptual processes is as yet undetermined.

The writer's view is that recognitions are judgments mediated in a great variety of ways: from reproductive processes, from moods, from syncopated inferences, and especially from feelings of relaxation, themselves of varying origin. In substantiation experimental evidence is offered, derived partly from other investigators' and partly from the writer's own work on the recognition of words and intensities of sound.

A Study of Some Logical Fallacies. KATE GORDON, Bryn Mawr College.

The attempt was made to present certain logical problems in such a form that their dependence upon the use of language could be somewhat reduced. This was done by means of a series of diagrams in which the problems were given in terms of colored circles. The solutions were expressed by the subject choosing and arranging his terms from a supply of wooden circles of different colors and sizes. Twelve diagrams were used, some of them offering the basis for valid deductions and others designed to offer the chance for the fallacies of illicit major, illicit minor, and undistributed middle.

Of fourteen adult subjects, only six made no mistakes in reasoning. A larger proportion of errors was made with negative propositions than with affirmative ones. The tendency to translate the diagrams into verbal form and to rely upon verbal argument was very marked; toward the end of the series, however, some subjects began to use the diagrammatic forms in their thinking. Of the three children who have thus far been tried with the test, two have experienced a curious difficulty in understanding the negative propositions. The study of logical fallacies is important if we accept the theory that fallacies represent primitive or undeveloped reasoning rather than merely wrong reasoning.

The Complication Experiment. C. S. YOAKUM, The University of Texas.

In a further study of the "Complication Experiment," the writer used the "exact fixation" method. A large number of preliminary readings was taken with different observers. These earlier series were given to familiarize ourselves with the different forms of apparatus used by previous investigators, to compare their results with our own, and especially to repeat the introspections and results obtained by Dunlap. In the main experiments undertaken, our

apparatus was practically a duplicate of that used by Geiger. These preliminary records duplicated results obtained by the previous investigators.

With the "exact fixation" method, we gave definite instructions to each observer. The left upper quadrant was used in the beginning; after practice, the field used was extended to the entire left half of the dial. O. was directed to fixate the point at the top of the dial, marked 360. He was warned to maintain exact fixation at all times and at the preliminary fixation points to use only peripheral attention in determining tentative coincidences. When he had thus found a point nearer actual coincidence, he might change fixation to this place. By successive approximations he was expected to establish coincidence.

By this method we found that different observers gave typically different results. In the first group of subjects, one made negative errors; one, positive; one, positive with a very small error; and one approximately equal numbers of positive and negative errors. Later an observer appeared who made a regular series of *reactions* to click or pointer. In all introspections, except those of one subject who made a preponderance of positive errors, we obtained voluntary evidence of the disturbing effects of the after image streak.

A black faced dial with white fixation marks and a black pointer with white tip, give the best "interruption" at the point of fixation, and subordinate other factors in judging coincidence. A further modification of the pointer was made. Here we used a revolving disk in front of the scale on which was placed a single black spot to simulate the pointer. Both disks are white here. By this means a very considerable portion of the positive after image could be removed.

Creative Imagination in Boys and Girls. GEORGE M. STRATTON, University of California.

Experimental evidence was obtained by having children in the same grades of a coeducational school write (*a*) stories of their own choosing, (*b*) stories which were upon a given theme, and (*c*) stories which were the completion of a story started. In examining the evidence an attempt was made to take account only of matters where the examiner could be free from subjective bias; that is to say, facts upon which there could not easily be a difference of opinion. The findings were that while there was much that was

common in the stories of the boys and of the girls, yet there was a noticeable difference in many respects. The girls, for example, introduced more "characters" than did the boys. They were much more inclined to make these characters vivid by giving them personal names. They were far more inclined to make the story vivid by introducing conversation or dialogue. In general, the girls showed greater emotional variety in their stories and especially a greater use of the kindlier emotions. The boys introduced oftener unsympathetic emotions and were readier, perhaps on this account, to compose stories with an unhappy ending.

Further evidence, obtained by the reports of students recalling their action in childhood, indicates that girls give themselves more fully to story-composing, feel more intensely the reality of what they thus create, introduce themselves more often as characters in their stories, and compose more spontaneously than do the boys.

These differences may in a measure be due to differences of experience and of social influence in the case of the two sexes, yet, coming as it does in a region where so little social pressure is brought to bear upon very young children, it would seem as if there was a residue of difference which could not be accounted for in this way. It would seem that there is at least in the story-composer's art a certain original difference in the imagination of boys and of girls.

The Psychology of Similes and Metaphors. JUNE E. DOWNEY, University of Wyoming.

Experiments upon Figures of Speech have yielded results varying with the method of procedure: (1) The situation requiring the reagent to complete similes, for the purpose of studying the figure-consciousness, proved to be highly artificial. (2) More enlightening was the method of observing the occasional simile or metaphor in the making. (*a*) The spontaneous replacement of one mental object by another, in the manner of dream-substitution, confirms Sterzinger's conclusion as to the relation between the dream and the metaphorical consciousness. (*b*) The presence of both parts of the metaphor in consciousness, and a tendency to emphasize the substituted object at the expense of the main object, do not support Stählin's conjecture that imaging the secondary part of the figure would tend to obliterate the main object and is therefore undesirable and infrequent. (3) Introspective reports from reagents required to read passages containing metaphorical expressions in various forms from the expanded simile to the most telescoped metaphors,

although difficult to obtain, since the metaphor consciousness involves a conscious attitude of double meaning, often including the tension of an unsolved problem, indicate that (*a*) Replacement of one mental content by another or fusion of the two could be definitely observed in certain cases by all reagents, the most favorable cases being the definitely worked out similes, which, however, might not prove as emotionally satisfactory as a more closely packed figure or one creating tension. (*b*) The most easily identified substitutes were those in which both parts of the simile were imaged visually. (*c*) The predominance of imagery for the accessory part in comparison with the main part confirms the results of Groos in the case of certain similes only. One simile gave for the majority of the reagents imagery for the main object alone with emotional toning for the figurative part. (*d*) In general, the mood-value of a simile or metaphor was often evident.

Experiments on Suggestion. WARNER BROWN, University of California.

Suggestions of some twenty-five different kinds involving imaginary perceptions and sensations, effects upon memory and recognition, effects upon æsthetic judgment and upon judgments of magnitude, were administered to a large number of university students. In all cases the suggestions were given in the form of misleading statements contained in written directions for what purported to be simple laboratory experiments on sensation, memory, æsthetic preference, etc. Most of the tests were successful in producing a positive response to the suggestion from a majority of the students; some succeeded with practically all of them. Women proved considerably more suggestible than men. Low, but generally positive, correlations were found between different tests. The correlations were higher for men, as a rule, than for women.

The Effect of Suggestion on a Case of Traumatic Hysteria. KATE BROUSSEAU, Mills College.

Pneumographic Experiments on Mongolian Idiots. KATE BROUSSEAU, Mills College.

Slides were exhibited showing some results of pneumographic experiments on a number of Mongolian idiots in the State Institution for Feeble-Minded Women, Vineland, New Jersey, and in

the Sonoma State Home, Eldridge, California. The pneumographic records of Mongols differ essentially from those obtained in experiments on other classes of defectives. The pneumographic curve is characteristic of the type.

Psychical Research

The Method of Psychical Research. James H. Hyslop, American Institute for Scientific Research, New York.

The method of psychical research is the method of all science. It has, however, for the accurate determination of the facts in alleged telepathy, clairvoyance, apparitions, and communication with the dead, shifted its plane of application from the conjuror and the theory of conscious fraud to the hysteric and the principles of abnormal psychology. The subconscious and its various phenomena of automatism and alternation of personality must now be the avenue of approach to the subject. Physical phenomena are of but secondary interest, beyond which the quest for proof of survival of death must extend to personal identity afforded by the incidents in the memory of deceased persons communicated in a supernormal manner. It is more than probable, as Kant said, that psychical phenomena will always be found in the borderland of hysteria and its congeners. The principles and method of scientific psychology must therefore determine the nature and significance of these phenomena and thus decide the issue of the supernormal.

The Stanford Foundation for Research in Psychic Phenomena. Frank Angell, Stanford University.

Experiments in Psychical Research at Stanford University. John E. Coover, Stanford University.

Some of the more available psychical phenomena which are amenable to the procedure of the psychological laboratory or to the use of scientific apparatus for adequate observation, and which through the results of their investigation have contributed to our knowledge of facts in this field, within limits of experimentation, are: (1) *Thought-Transference.*—The setting of a laboratory experiment in thought-transference evokes in the normal reagent automatic sensory and motor phenomena which influence his judgments, enabling him to assign to them from two to five grades of certainty, and determining his expectation for a greater number of

R cases than chance allows. Judgments given with a high degree of certainty have no advantage over the others, and R cases (in 10,000 experiments) do not exceed the limits of chance. Similar conclusions are drawn from 2,500 experiments on the "Feeling of Being Stared At." Richet's *Suggestion Mentale* was not found. (2) *Subliminal Impression.*—Guessing on letters and digits, exhibited with a Wirth tachistoscope variously for from 4.9 to 9.5 thousandths of a second and unperceived by the reagent, yielded some evidence for the influence of subliminal impression upon judgment. (3) *Auditory Assimilation.*—Results of 15,000 records of syllables heard under varying conditions all of which were adequate for communication, show that when judgment must depend upon sensory impression R cases on syllables fall to 40 per cent., and on consonantal sounds to 60 per cent. Central contribution to perception, under these conditions, consequently, is 60 per cent. and 40 per cent. respectively. (4) *Dowsing.*—150 determinations for gold resulted in 3.3 per cent. R cases for gold and 5.3 per cent. for copper as against the 3.3 per cent. of chance. Copper was a control determination. (5) *Séance Phenomena.*—Pneumographic and pulse (carotid) tracings by a kymograph show that the "psychic's" vocal musculature acts synchronously with "independent" speaking, and imprints upon smoked surfaces indicate physical contact during exertion of "independent" force.

A Case of Pseudoprophecy. LILLIEN J. MARTIN, Stanford University.

The point of the paper is to show that the striking resemblance between a Stanford poster made by a student in geology three years before the earthquake of 1906 representing the Stanford memorial arch as partially demolished, and a photograph of this arch as it appeared after the earthquake, is a case of scientific prediction and not of prophecy as has been said in the newspapers and elsewhere.

MISCELLANEOUS STUDIES

The Justification of Psychobiology as a Topic of the Medical Curriculum. DR. ADOLF MEYER, The Johns Hopkins Hospital, Baltimore.

A certain level of the activities of the biological organisms we study could not be initiated except as full-fledged conscious processes. These activities have of late been summed up as the data

of behavior, forming the subject-matter of psychological investigation. Based on a nominalistic and anthropomorphic emphasis of the subjective experience, parallelism is made to serve as an intermediary between the absolutely subjective psychologizing of the past and the demand for strict objectivity of the natural sciences. The compromise has not been able to overcome the psychophobia of scientists. Without wanting to disclaim the practicability of studying many problems on the parallelistic basis, I assume in my work the common-sense attitude that we study not an ego but the mentally connected activities of any biological organism, or individual, or group, as the domain of psychology, and that we embody in this field all the mentally connected relations including what is sometimes specified as "purely mental" inasmuch as we can make it a topic of objective consideration and experimentation. The division of sciences lies between those dealing with the dynamic biological processes of the entire individual as opposed to the activities of detached parts, and those dealing with adynamic logical relational connections. Interactionism is eliminated by a consistent objective method. It must be possible to study activities of the level of mental integration in others as well as in ourselves, and there is as little need of abandoning objective methods as there has been any need of abandoning the objective methods of physics in the face of the psychologizing considerations of Herz and Mach.

The Functions of a Psychologist in a Hospital for the Insane. SHEPHERD IVORY FRANZ, Government Hospital for the Insane, Washington, D. C.

It is only in the institutions for the insane with the highest ideals regarding their duties to patients and the community that a psychologist can have functions. His functions in general are those of investigation, and this investigation is of mental conditions in the different forms of mental diseases, not from the psychiatric standpoint of differential diagnosis and treatment and not from the purely medical standpoint, but from the scientific standpoint of inquiry and advance of knowledge of mental abnormalities. In this work no exclusive form of psychology, analytic or functional, should be used.

Mental Hygiene of the Backward Child. HENRY H. GODDARD, Vineland, N. J.

The backward child has a peculiar mind. Generally it is a mind that has ceased to grow. Sometimes it continues to develop, but slowly. In either case treatment such as is given to the normal developing mind is unhygienic. It is like requiring of a baby physical work appropriate to an adolescent. It causes mental strain, perverts the character and discourages effort. The backward child largely lacks associative memory, creative imagination, power to associate by similarity and to deal with abstractions. He must therefore be trained in concrete activities.

Prognostic Value of the Binet Tests. EDGAR A. DOLL, Vineland, N. J.

In the diagnosis of feeble-mindedness we distinguish two types of borderline cases: those of mature age who approximate normal capacity, and those of younger years who, although not yet fully retarded mentally, will ultimately never have normal capacity.

These cases while not showing the requisite three years backwardness by the Binet Scale nevertheless by the quality of their answers are to be differentiated from the thoroughly normal child. In other words, it now seems probable that the Binet Tests may be able to show not only those who are already feeble-minded, but those who are destined to become so.

Mental Hygiene for Freshman, as a Subject of the Curriculum. Discussion opened by LILLIEN J. MARTIN, Stanford University.

Methods of Studying Ideational Behavior in Man and Other Animals. ROBERT M. YERKES, Harvard University.

Attempts to devise methods for investigating imagination, simple ideation, and reasoning in infra-human animals have been many, but no good comparative method has been developed. Casual tests, qualitative merely, predominate. Of the many methods, extensively if not intensively used, the following are the most noteworthy: (1) The problem or puzzle-box method (Thorndike *et al.*); (2) the imitation method; (3) the use of tools; (4) the substitution method; (5) the delayed response method (Hunter); (6) the serial stimulus method (Cole); (7) the quadruple-choice method (Hamilton).

No one of these types of method at present meets the following

requisites of a good means of studying ideational behavior comparatively. (1) Applicability to a wide range of organisms, ages, stages, and conditions thereof, including man; (2) standardization of apparatus and procedure so that directly comparable data shall be obtained; (3) quantitative results must be yielded, varied but definitely describable according to an accepted convention; (4) the results must remain intelligible and interpretable irrespective of observer, time or place, for only thus can the method of comparison achieve its highest value to genetic psychology.

I therefore present for trial and criticism a method which in theory and practice seems to me superior to others. It is a relational method, involving multiple choices, and hence called the multiple-choice method of studying ideational behavior. Reaction mechanisms are presented to the subject in groups of varying size, position, etc. One only of the mechanisms of a given group will yield satisfaction when operated, the others yield failure or some more rigorous punishment. The correct mechanism always bears a certain definite and constant relation to the other members of the group, for example, the middle member. That the method is widely applicable is certain, for already through adaptation of the reaction mechanism to the structure and action system of each type of subject, it has been used successfully with the crow, pig, rat, ring-dove, monkey, orang utan, child (normal and defective), and adult (normal, defective, and insane). It is already obvious that the method enables us to compare, as has never before been possible, the responses, to certain standard situations, of human and infra-human, normal and abnormal, mature and immature subjects.

The Behavior of Cells. S. J. HOLMES, University of California.

Experimental studies in embryology and observations on the activities of cells kept in hanging drop cultures have shown that the behavior of cells plays an important part not only in establishing the normal form of the organism, but also in maintaining this form, and in restoring it after the loss of parts. Different tissue cells have their specific modes of reaction to stimuli which are as characteristic as the peculiar behavior of different species of protozoans. The activities of leucocytes are well known. Mesenchyme cells commonly undergo extensive migrations during embryonic development, and in many animals the primary sex cells wander for a considerable distance before reaching the sex organs. Connective

tissue cells and pigment cells may creep about quite extensively even in the adult animal. Many cells such as those of epithelium which appear to be quite passive so far as locomotion is concerned, are able when their normal relations are disturbed to become very active and to creep into new positions in such a way as to effect a restoration of the normal condition. The characteristic layered arrangement of epithelial cells in the body is the outcome of their thigmotropic and other tropic reactions.

The outgrowth of the nerve fiber is apparently the result of a form of amœboid movement much like the extension of a fine pseudopod of one of the Rhizopoda. The paths followed and the connections made by nerve fibers, and the interconnections made by ganglionic dendrites in the central nervous system are probably the effect of a series of thigmotropic and chomotropic responses of developing nerve cells. So the architecture of the nervous system is largely the expression of the peculiar behavior of its cellular components, and as the psychology of an animal is determined in great measure by the organization and connections of its nervous system, we may say that organismal psychology is to a great extent the outcome of the specific behavior of the cells which make up an animal's organization. What might be called cellular psychology has been studied but little. Most attention has naturally been given to the study of the behavior of the organism as a whole and its relations to environmental agencies. But investigation of the reactions of cells and tissues carried on much as the psychologist studies the behavior of lower organisms promises to aid in the solution of many biological problems and to shed light on problems lying more strictly within the recognized scope of psychology.

GENERAL REVIEWS AND SUMMARIES

MEMORY, IMAGINATION, LEARNING, AND THE HIGHER MENTAL PROCESSES (EXPERIMENTAL)

BY J. W. BAIRD[1]

Clark University

I. Memory, Imagination, Learning

(*a*) *Summaries, Systematic Treatises, and Discussions of General Topics.*—Brandell's monograph on imagination (**3**) traces the evolution of the significance of the term from Aristotle through Saint Augustine, Wolff, Kant, Lotze, Wundt, Ebbinghaus and Meumann. In a survey of the experimental literature,—Külpe, G. E. Müller, Ach, Dürr, Perky, Martin, Moskiewicz, Selz and others,—he discusses such topics as the materials of imagination, assimilative and associative imagination, the relation between thinking and imagining, and the creative power of imagination. While the monograph contains nothing that is essentially new, it presents a statement of the various views and an evaluation of certain of the experimental findings. Brandell's own position is conservative; the influence of Wundt is evident throughout his monograph. Gallinger's book (**16**) undertakes to analyze the state of consciousness which constitutes remembering; he proposes in a later book to deal with the varieties, the forms and the conditions of remembering, together with such topics as recognition and illusions of memory. In the present work he points out that the essence of the remembrance-consciousness consists in the fact that we there project ourselves into our past or assume an attitude toward our past; and it is further characteristic of remembrance that in this attitude, we are immediately aware that our present experience refers definitely to our past. In consequence of this there is a certain analogy between remembering and perceiving; but re-

[1] The writer is indebted for aid in the preparation of this paper to Dr. S. Carolyn Fisher, Dr. Karl J. Karlson and Dr. George S. Snoddy, all of Clark University, and to Dr. Elizabeth L. Woods, of Vassar College.

membrance is sharply demarcated from all knowledge which is based upon influence, reflection and the like. The author, however, refuses to formulate a definition of remembrance, chiefly on account of difficulties of language, but he feels that in pointing out its specific criteria he has sufficiently differentiated it from other exeriences.

Tsanoff (59) raises the questions: "What is the peculiar coloring of consciousness and what is the particular correlation of mental elements which characterize the processes of the poetic imagination? Precisely how can the poet's actual construction of a poem be described in psychological terms?" He points out that the experimental investigation of the actual process of poetic construction is difficult since this process is essentially spontaneous, and hence is not subject to laboratory control; and he suggests that a comparison of the first draft of poems with later emended copies promises to furnish a fruitful method of investigation. Beck (2) calls attention to the fact that such activities as entail a considerable element of danger (climbing precipitous mountainsides, duelling, and the like) are attended by a superlative degree of mental concentration which is rarely found elsewhere; that this concentration is of exceptionally high degree is attested by the fact that such experiences are remembered for many years, and by the fact that serious physical injuries are momentarily unnoticed. Beck also believes that after the threatened danger is past one feels a mental recuperation as after a refreshing sleep. A review of Thorndike (56) will be found elsewhere in this volume of the BULLETIN.

(*b*) *Imagery.*—In an investigation undertaken by Misses Adler, Williams and Washburn (1) an attempt was made to determine what correlation obtains between the fidelity of one's visual imagery and the control of one's visual imagery. The method consisted in measuring the observer's accuracy in reproducing a visual nonsense-figure, and in measuring her ability to control her visual imagery (*i. e.*, after a checker-board diagram of sixteen compartments had been presented the observer was asked to close her eyes and imagine the content of a given compartment to be shifted to another specified compartment). The results obtained from fifty-three observers show a complete absence of correlation between accuracy and control of visual imagery.

A reading of Freud's *Traumdeutung* led Thompson (55) to investigate certain dream phenomena of condensation, compensation, ratiocination, amnesia, etc. An examination of a number of dreams leads the author to conclude that in any given individual there is

no essential difference between the relative preponderance of the various modalities of imagery in dream life and in the waking life; that the central *motif* of the dream tends to appear in terms of that modality of imagery which predominates in the waking life; that condensation occurs more frequently in visual than in auditory imagery; that imagery of the dominant modality is less readily forgotten than images of other modalities; and that the imaginal content of the dream can seldom be referred to a present sensory stimulus. The author believes that a dream may contain instances of critical thinking and reasoning which possess 'all the clearness and logical consistency of waking trains of thought.' Spaier's investigation (**52**) of the evoking of images and of the ideation of various problems and situations furnished the following results: The image is not fixed and stable, but develops gradually to a maximum and disappears slowly through a twilight stage; the image is not 'useless lumber'; it is essential to meaning, and it is never present to consciousness without being 'saturated with meaning.'

After presenting a description of the Pawlow method and a summary of the results, Miss Dontchef-Dezeuze (**6, 7**) undertakes to discover a psychological basis for the conditioned reflex. This phenomenon is to be explained by assuming that mental imagery has intervened between the stimulus and the response; if no imagery were present, it would be impossible to understand how the dog could recognize a familiar stimulus (!). The imagery is to be conceived as of complex structure; while it contains sensory components from various modalities, its essence is furnished by affective images. The author believes that objective psychology is able to throw a flood of light upon the subjective study of memory and imagination.

In an investigation of methods for determining ideational type Exemplarsky (**8**) presented consonants in visual and in auditory fashion, introducing various distractions and various instructions as to method to be employed in learning. In certain cases, reproduction was tested immediately after presentation, in other cases after an interval of ten seconds had elapsed; and the learners furnished introspective descriptions of their learning and their reproducing. A comparison of the results obtained in these various experiments leads Exemplarsky to conclude that a combination of several methods must be employed for the diagnosis of ideational type. The method of immediate reproduction possesses

certain advantages (for instance, it facilitates introspection), but it should be supplemented by a method of delayed recall. The author reports that for the differentiation of the verbal sub-types, variable modes of presentation furnish better results than the distraction method.

Springer (53) presented numbers in various fashions to four hundred and ninety-four children, seven to fifteen years of age: In one case the numbers were seen; in another case they were heard; in another case they were seen and pronounced by the children; in a fourth case they were heard and pronounced by the children. The results showed that only about two per cent. of the children relied exclusively upon 'one kind of reproduction'; in young children the best results are obtained from auditory presentation, in older children from visual and visual-motor presentation. Immediate memory is most efficient in the fifth and sixth groups. The auditory type predominates in the first and second grades; the visual or the visual-motor in all the other grades, there being a rapid increase in the visual type from the first to the fifth grade, the visual-motor type being predominant among the group of five hundred children. Children of a dominantly auditory type find that the introduction of the motor element is a distinct disadvantage.

Kollarits (23) describes the nature and the origin of our mental representation of various ideas; persons and places which one has never seen are definitely envisaged and it is possible to discover that one's mental picture is the product of associations of various sorts (for instance, an author's style, or his opinions, or his nationality, or his name contributes to our visual representation of his appearance) in which affective association plays a prominent part. Claparède (5) adds that the appearance or the sound of a person's name determines our mental representation of the person,—a fact which has been recognized by authors who have invented such names as Tartarin or Pickwick.

(*c*) *Recognition.*—In an investigation of recognition and reproduction, Rybnikoff's experimental material (48) consisted of groups of digits, and he employed time-intervals of one minute, five minutes and ten minutes. The numerical data from his reproduction experiments furnish an approximate confirmation of the traditional curve of forgetting; and the numerical data from his recognition experiments indicate that the efficiency of recognition follows the same course with the lapse of time. When the number of presentations is increased from one to three and to six, the

number of recognitions (average for seven observers) is increased from sixty to seventy-four and seventy-eight,—the effect of the increase in number of presentations being especially evident in an increase in the number of 'certain' recognitions. The recognition-time decreases markedly with the number of presentations; an analysis shows that there is a close correspondence between certainty of recognition and brief recognition-time, the most certain recognitions being about twice as rapid as the uncertain recognitions. Rybnikoff advocates the view, in opposition to G. E. Müller, that there is an intimate internal relationship between the phenomena of recognition and of reproduction. He holds that the experimental investigation of reproduction and recognition must mutually supplement each other, and a complete picture of the phenomena of memory can not be obtained from an isolated investigation either of recognition or of reproduction. Ponzo (41) presented pictures and objects to fifteen boys in an attempt to determine the influence of various mental factors upon the processes of recognizing and naming. In his discussion of recognizing he differentiates the influence of complexity, size, color and particularity of object, influence of æsthetic factors, and influence of enlargement or reduction of customary size; and in his discussion of naming he differentiates the influence of the customary name, influence of the name in other languages, influence of ambiguity of name, influence of the essential quality of the object, and influence of the use of the object.

Miss Heine (18) made a further investigation of the fundamental difference between recognition and reproduction which Müller had pointed out. Lists of nonsense-syllables were learned, and after an interval of eight minutes tests of recognition or of reproduction were applied. In certain cases pictures were observed and described, or other nonsense-syllables were learned, during the interval between the learning and the test; in other cases no material was presented during the interval, the observer simply walking about the room, looking out of the window, etc., but endeavoring not to think of the syllables which had just been learned. It was found that the subsequent presentation of new material gave rise to no retroactive disturbance in the case of recognition, but that reproduction was very much impaired by the subsequent mental activity,—not only were the number of correct reproductions decreased, but the reproduction-time was increased. The author concludes that since mental activity following upon the learning

of a series of syllables gives rise to a retroactive disturbance of the associations which have been established, and since no such effect upon the recognition of syllables takes place, it is evident that recognition is not dependent upon association. Reproduction and recognition are, therefore, fundamentally different processes. In a comparative study of recognition and recall Myers (35) finds that the efficiency of recognizing (discrete words) is about two and a half times that of reproduction, and that the correlation between the two is surprisingly low. He finds that affective components are much more prominent in recognizing than in recalling.

(*d*) *Association and Inhibition.*—Foster (12) investigated the factual justification for assuming the existence of perseverative tendency,—this term being employed to designate the fact that when a given content has once been present in consciousness its recurrence need not be attributed to any other condition than its previous presence in consciousness. Nonsense-syllables were employed as materials, and after intervals which varied from one minute to twenty-four hours, reproduction was tested by the method of right associates and the method of retained members. In his various experiments, the instructions were varied to emphasize rapidity of reaction in certain instances and accuracy of reaction in others. Foster's results show that it is unnecessary to assume that an idea tends to arise without the probable coöperation of associative tendencies. Such syllable-ideas as came to consciousness during the interval between the learning and the testing were found to follow or to accompany an idea of a larger situation; and the syllables, correct or false, which were reproduced in the tests also owe their reproduction to associations of various sorts. Not only may one question the assumption that mental contents recur spontaneously, but the spontaneous nerve functioning which such an assumption implies is rendered improbable by the known facts of physiology.

In Maloney's experiment (28) lists of digits were added by sixty-five persons; from an objective analysis of the errors, the author draws various conclusions as to association, suppression and perseveration. Kohs (22) traces the development of the association-reaction; he emphasizes its practical significance and adds a list of complex-indicators.

Previous investigations of effectual and generative inhibition (or reproductive and associative inhibition as Ebbinghaus calls them) have shown only that these two forms of inhibition take place

between elements which belong to different complexes of ideas; Frings (14) seeks to discover whether such inhibitions also take place between elements which belong to the same complex. His materials consisted of lists of nonsense syllables, three consecutive syllables of a list constituting a group or complex; and the lists were so constructed that certain syllables of certain complexes recurred in other complexes, in accordance with an appropriate pre-arranged plan. The results show that when the elements form a unitary and coherent complex there is no evidence of an inhibition; but when the complex is incoherent and loosely articulated, the recurrence of identical elements gives rise to inhibition,—the amount of inhibition varying with the degree of non-coherence. Several factors may contribute to the non-coherence of the complex: the learning-type, and the physiological condition of the learner.

Brown's experiment (4) consisted in establishing an habitual reaction, and subsequently in assigning a task whose accomplishment inhibited and was inhibited by the habitual reaction. The primary habit consisted in distributing a pack of cards in a prescribed fashion; and the secondary habit consisted in distributing the cards in another fashion. The time-records show that slow reagents are less impeded by the interference than rapid reagents; there seems to be a correlation between freedom from interference and capacity to learn, since those reagents who are most capable of acquiring the primary habit seem to be relatively incapable of acquiring the secondary (interfering) habit. There are wide individual variations in capacity to shift from one group of reactions to another, the loss of speed due to the shift varying from one per cent. to twenty-three per cent. Reagents who are relatively slow at the outset tend to remain relatively slow throughout, although their inferiority decreases somewhat particularly during the earlier stage of practice.

(*e*) *Learning, Remembering and Forgetting.*—Kühn (24), Myers (34) and Thorndike (57) report re-investigations of the effect of recitation upon learning. Kühn employed significant and non-significant materials; and he tested retention, by the method of correct associates and the saving method, after intervals of one, two or four days. He found that recitation is advantageous, in most learners, but the advantage is greater the less coherent and significant the material, and he concludes that the advantage is due to the fact that an attempted recitation induces a more thorough

working-over of the material. Kühn differentiates and describes various different methods of procedure in learning. Myers employed lists of words whose retention was tested at intervals up to three weeks,—the object being to determine the effect of recalls which were attempted during these intervals. He found attempted recall improves retention; two recalls are better than one and delayed recall (after five minutes) is better than immediate recall. Myers reports that a remarkably large number of words appear in the later recalls which were not present in the earlier recalls. This same phenomenon is reported by Hugeunin (**19**) who finds that the number of lines of poetry which can be recalled ten minutes after learning it is less than the amount which is reproducible at any subsequent time (up to eight weeks). Thorndike reports that in an experiment where twenty-eight adults learned vocabularies, in one case by successive readings and in another case by reading and attempted recall, the recall method possessed no superiority over the reading method.

In an objective and introspective study of the process of learning Perrin (**39**) employed an outdoor maze of ordinary dimensions and a miniature pencil-maze,—the learner being blindfolded in the latter experiments. It was found that the ability to make an errorless circuit developed into an ability to image the path and to describe it verbally or graphically. The learner set himself the task of discriminating the true path from the false, and of retaining a remembrance of the former; he also attempted to organize his knowledge in such a way that it could be used for effective control. During the early circuits, whatever paths presented themselves were tried in an aimless fashion, this initial period being followed by an increasing tendency to hit upon the true path, and an increasing rapidity of circuit. Perrin's introspections, which were confirmed by numerous ingeniously devised control-experiments, show that the process of learning the maze is based essentially upon imagery,—concrete visual imagery together with verbal and motor images of various sorts.

In Miss Perkins' experiments (**38**) sixteen repetitions were devoted to lists of nonsense-syllables, the repetitions being variously distributed; retention was tested after an interval of two weeks. The results are exceedingly irregular, but they indicate that distributed repetitions are more efficacious than accumulated repetitions. Lyon (**26**) also found that distributed repetitions are more advantageous for non-coherent materials (nonsense-syllables,

digits), while for coherent materials (prose, poetry) accumulated and distributed repetitions are about equally effective. In the case of non-coherent materials, the total learning-time varies with the length of the list of material when the distributed method of learning is employed, but it varies with the square of the length of the list when the accumulated method is employed. Lyon concludes that the optimal distribution of single readings is obtained when the length of interval between successive readings increases in arithmetical proportion. Pyle (**42**) reports an experiment which investigated the relative advantage of five hours' practice per day and one hour's practice per day in learning typewriting. Ten learners took part in the experiment, five practicing for ten half-hour periods a day with half-hour rests between practices, and five practicing for two half-hour periods a day, one in the forenoon and one in the afternoon. Learners of the former group practiced for a period of nine days and those in the latter group for a period of forty-five days. The results (which are exceedingly irregular and unconvincing) show that the group whose practice was distributed, wrote more rapidly throughout than the group whose practice was accumulated; but a subsequent test indicated that the retention of the learning was not more permanent in the former case than in the latter. In Strong's investigation (**54**) intervals of varying length elapsed between successive presentations of the materials (advertisements); it was found that an interval of a day produces maximum retention, while intervals of a few minutes, and a week are much superior to that of a month. As to length of learning-time, it was found that the greater the number of impressions made at one time, the less is the permanent retention of any one of them. In any situation which involves both number of impressions and length of interval the former is the more important factor. Winch (**61**) reports the results of an investigation of the relative value of different methods of learning to spell. Two lists of words of equal difficulty were prepared; one list was learned by a silent visual method, the other list by a combined visual-auditory-vocal-motor method. The results show that the visual method was more advantageous throughout, a fact which is to be interpreted in the light of the author's remark that in the latter case the pupils learned the spelling "without the stimulus or interference of the teacher's direction." Ruckmich (**47**) examined the current literature of piano instruction with a view to determining what types of association are fundamental to the methods

advocated by various piano-teachers and piano-schools. He finds a complete disagreement among the experts in this field; certain teachers emphasize the significance of the visual and kinæsthetic perception of movements made by the finger, hand and arm; others emphasize the significance of establishing an association between the auditory and the kinæsthetic perceptions. The scientific investigation of the psychology of piano playing has been neglected, but a beginning has been made by Seashore, Raif, Binet and Courtier. Schlüter (**50**) attempted to evaluate the relative merits of the 'word method' and the 'object method' in teaching a foreign language. In one case foreign words were presented in conjunction with their equivalents in the mother-tongue; in the other case the foreign words were presented in conjunction with the objects which they designated. It turned out that each method has its advantages and its disadvantages. When the result of the learning is tested by the learner's ability to translate from the foreign language the 'word method' proved to be superior; but the 'object method' gave better results when the test consisted in translating into the foreign language or in reproducing the foreign name of a presented object. Neither method of teaching proved to be so qualitatively 'pure' or so specifically different from the other as has been supposed,—when an object is presented the learner tends to ideate the name by which it is known in the mother-tongue, and when a word is presented the learner tends to ideate the corresponding object.

Watkins (**60**) finds that the span of immediate memory (for digits and nonsense-syllables) is considerably greater in bright pupils than in dull pupils. When the group of material is so great as to approximate the limit of memorial span, the bright child apprehends it as a unitary whole, while the dull child tends to apprehend it as a series of isolated and independent terms; perseveration and retroactive inhibition are more frequent in backward than in intelligent children. Scheinermann's experiments (**49**) show that there is a progressive decrease of memory span (for isolated letters) with progressive increase of fatigue. His observers report that fatigue decreases the activity and narrows the compass of attention.

A symposium discussion of the rôle of repression in forgetting (**37**) is characterized by its guarded and conservative attitude toward Freudianism. Pear attempts to differentiate between cases of forgetting where the lapse is capricious and temporary, and cases

where it is due to the inevitable fading of the memorial content; the former alone he is disposed to explain by assuming that a process of active repression has taken place. Wolf refuses to grant the validity of Pear's distinction; all cases of forgetting may be explained by the traditional factors of retention and recall, and the appeal to resistance (repression) is gratuitous. Mitchell holds that certain cases of normal and pathological forgetting are most readily explained by repression; but there is no justification for supposing that all mental dissociation can be accounted for by repression or that all forgetting is due to a tendency to avoid pain. Loveday points out that the Freudian view is absurd since it implies that every content that can ever be recalled must be present in the unconscious all the time,—an absurdity which owes its origin to Freud's associationism and his lack of a theory of judgment. Most cases of forgetting in normal individuals are not due to a desire to forget. Frink (15) describes three cases of forgetting which he attempts to explain in Freudian terms.

Rose's investigation (46) aimed to test the validity of the distinction which Müller makes between visual 'topical' memory and the traditional visual memories of form and of color. Twenty-five lamps were arranged in a frame, and they were so coupled that they could be flashed in any desired sequence, regular or irregular,—the observer being required subsequently to reproduce the positions of the lamps and the sequence. In supplementary experiments nonsense-syllables were substituted for the lamps and an attempt was made to exclude the participation of form-memory. The results justify the hypothesis of a 'topical' memory; and they furnish an analysis of various factors which play a part in the remembering of positions and sequences.

(*f*) *Attitude, Intention and Determination.*—Fernberger (9) reports the case of an observer who gave not a single judgment of equality in a series of twelve hundred judgments of lifted weights. A special investigation, under varied instructions, showed that the *Aufgabe* is of prime significance in the process of judging, and confirmed the hypothesis that the absence of judgments of equality was due to the fact that the observer had set himself the task of discovering a difference. In an investigation of the 'will to learn' Miss Panicelli (36) read a story to groups of children, in one case warning them in advance that they would be asked to reproduce it, and in another case omitting the warning. The learning was approximately twenty-eight per cent. more perfect in the former

case than in the latter. The 'will to learn' was more effective in girls, and in older and more intelligent children. In an attempt to determine what is the best means of acquiring facility in using a multiplication table Kirkpatrick (20) investigated the relative efficiency of three methods. A multiplication table was placed in the hands of two groups of students, one group being instructed to memorize the table, the other to begin at once to practice writing the numbers which appeared in the table. Three weeks after the preliminary practice both groups were tested as to their remembrance of the table, when it was found that the 'practice' group excelled the 'memory' group. In another experiment students were required to multiply numbers, one group being provided with a multiplication table, while another group discovered the products without a multiplication table; here again it was found that the 'computing' group obtained a much more accurate and permanent knowledge of the products.

Meyer (30) presented lists of nonsense-syllables and after an interval of twenty-four hours he re-presented a certain syllable with the instruction that the observer should attempt to recall the syllable which had followed it in the original series. When the next syllable was presented the observer was asked to state whether it was 'new' or 'old,'—the object being to determine whether preparedness to recognize really facilitated the process of recognizing. The results (recognition-times and number of correct recognitions) show not only that preparedness conduces to recognition but also that the state of preparedness may persist for a considerable time.

Myers and Valentine (33) differentiate a number of individual differences in attitude of observers toward tones. These attitudes are four in number: An objective attitude which has to do with the relation of the tonal stimulus to the observer's standard of purity, pitch, etc.; a character attitude which is due to the observer's tendency to personify tones; an associative attitude which is characterized by a wealth of ideational content suggested by the stimulus; and an intra-subjective attitude which is characterized by an emphasis upon the sensory effects, the feelings, and the self-activity aroused in the observer by the stimulus. The authors point out that certain of these aspects are divisible into various sub-aspects; there is a general agreement between attitudes adopted by observers toward colors and toward sounds, but certain important differences are described. The authors also discuss the relative frequency of the various attitudes.

II. Higher Mental Processes

Maday (**27**) outlines a hierarchy of mental functions and raises the question of the intellectual equipment of the horse. Concepts are formed through a gradual process of apprehending differences; thinking consists in associating concepts into judgments and judgments into conclusions. Three stages may be differentiated in the forming of concepts and in thinking, and it is doubtful if the horse ever passes beyond the initial stage in either process.

Kline (**21**) describes an experiment for the investigation of the psychology of reasoning. The materials consist of problems relating to the calendar, and the method consists in obtaining an introspective analysis of the processes involved in solving the problems assigned. In Peterson's investigation (**40**) of the generalizing ability of children, questions were presented to children from ten to fourteen years of age, the questions being so framed that their successful answering involved processes of generalizing. The author reports that an examination of the answers furnishes a concrete picture of the characteristic generalizations of children. The rate of improvement with age varies greatly in the different generalizations; the averages indicate that ability to generalize almost doubles during the years from ten to fourteen inclusive.

Fox (**13**) reports that he endeavored "to demonstrate the importance of imageless thought," and that his endeavor was crowned with success. Sentences were read aloud to fifteen observers (only one of whom was found to be dominantly motor!) who were subsequently asked to furnish introspective descriptions of the process of understanding the meaning. The author is convinced that understanding is possible without imagery, but that (relevant) imagery tends to make its appearance in cases of delay or conflict in consciousness, *i. e.*, when the observer disagrees, doubts, suspends judgment, and the like. In an investigation of the relationship between visual imagery and thinking, Miss Martin (**29**) presented visual figures, and subsequently asked her observers to reproduce their visual images of the figures. It was found that the content of the observer's remembrance of the figure far exceeded the content of his visual image, and Miss Martin is convinced that this excess is to be referred to non-imaginal components. The value of the visual image depends not upon the information which it furnishes, but upon the fact that it supports the attention, illustrates and reinforces non-sensory thinking, furnishes a feeling

of certainty, and constitutes a core around which non-sensory thinking accumulates. The visual image, then, is not essential to thinking but is merely incidental, and in many instances the image is the product of non-sensory thinking. Miss Town (**58**) reports an experiment in which six blind individuals and six normal individuals were tested as to ability to spell backwards and ability to recognize words when spelled backwards. The tests show a slight difference in favor of the seeing group, both as regards time and errors. It turns out, however, that vocal-motor factors (and not visual imagery alone) played an important rôle in the tests. The author concludes that the tests in question have little or no value as objective tests for the diagnosis of visual imagery, and that visual verbal imagery assists the process of spelling rather through its attribute of relative spatial position than through its attribute of form.

Miss Mulhall's experiment (**31**) aimed to determine whether "the person who is a good judge in one situation is also a good judge in another"; "whether the individual who is consistent in judging one situation is also consistent in judging another"; and "whether the most consistent judge is the best judge." Thirty-four persons were asked to arrange a series of weights, photographs, propositions and specimens of handwriting on the basis of heaviness, kindliness, belief, and legibility, respectively; and from a comparison of the various arrangements the author concludes that "there is no such thing as general judicial capacity," that individuals who are consistent in judging one situation are not necessarily equally consistent in judging another situation, and that the correlation between judicial capacity and personal consistency probably varies with the objectivity of the judgments.

In Finkenbinder's investigation (**10**) an attempt was made to determine what mental contents are involved in the remembering of logically related data. The materials were mathematical and other problems which were solved by the observer. After intervals varying from a month to more than five months, the observers were asked to recall both the problems and the solutions, and to furnish introspective descriptions of their mental procedures and their mental contents. An examination of the introspections showed a striking similarity of procedure and of content in the eighteen observers who took part in the experiments, although certain typical differences were revealed. Visual images constituted about ninety per cent. of the total mental content of all remembrances,

even in cases where imagery from other modalities had originally been employed in envisaging and solving the problem. In the case of certain types of problems, however,—problems which had to do less with concrete objects than with turns of language and obscure meanings,—verbal imagery (auditory, vocal-motor and visual) tended to be present. The recall imagery first appeared in vague and schematic form but subsequently and gradually became more definite, detailed and meaningful,—its stability and non-conflicting character contributing to a feeling of certainty. Processes of reasoning which had been employed in solving, were seldom remembered (after an interval of a month or more); and they were never recalled in other than imaginal terms. The observers discovered no memorial content which could not be analyzed into imaginal components.

Liebenberg (**25**) presented groups of five to twenty-one dots tachistoscopically, and asked his observers to estimate their number and to furnish an introspective description of their procedure. It was found that small groups (up to about seven dots) were usually estimated correctly, while large groups were over-estimated, the estimates showing a preference for certain numerals. The procedure employed in estimating was analytic, especially at the outset. A general impression of 'many' was followed, during the presentation, by an accurate apprehension of a certain section of the group; then after the presentation the estimate was formed by means of certain criteria, such as position and extent of group, general impression, number observed to be present in the part-group; and this estimate was finally brought into relation with the general impression. In later sittings the procedure became abbreviated, a particular numeral associating itself directly with a particular impression of size of group. The author differentiates two types,—rapid, mechanical estimators, and slow, cautious estimators.

The phenomenon of sensory contrast or 'physiological contrast' has long been familiar to psychologists in the domain of vision, temperature and elsewhere; Flügel and Rivers (**11**) call attention to an analogous phenomenon, in the higher mental level of estimating, judging, and recognizing, which they call 'psychological contrast.' The stature of the average man is over-estimated when he stands beside a dwarf, and under-estimated when he stands beside a giant; familiar objects and scenes seem altered when we return to them after an absence; and illustrations of the same principle may be

found in the domain of moral and æsthetic judgment. Psychological contrast may be defined as the influence exerted on our judgment of the quality of an object by our experiencing other objects of the same kind but of different quality,—the influence being in the direction of an apparent amplification of this difference. The authors report a series of experiments which show that contrast-stimuli or contrast-situations make themselves felt in one's estimates of weights, of lengths of lines, of sizes of angles, in one's recognition of colors, and in one's judgment as to the rapidity of auditory and visual stimuli.

Reichardt (44) investigated the process of comparing remembered objects,—colored triangles of different forms and sizes serving as his materials, and an interval of about five minutes being allowed to intervene between presentation and comparison. The accuracy of comparing was found to depend upon the degree of completeness of the learning and upon the momentary condition of the observer; the accuracy decreases progressively with the lapse of time. Certain observers tend to over-estimate objects after a long interval, while others tend to over-estimate those which have but recently been presented. In the process of learning the size of the triangle, the observers resorted to various expedients: They applied verbal designations; they applied an ideated measuring-rod; they noted sizes of the surrounding regions; they attempted to remember the absolute size of the triangle; they attempted to compare the present triangle with other triangles of the series; and in the subsequent act of comparing, these various criteria were employed. The impression produced by the general form of the triangle (its slenderness, or its stoutness, etc.) plays an important part in the process of comparing; the judgment was frequently made in terms of absolute estimate rather than in terms of comparison.

Gemelli's monograph (17) contains a detailed analysis of the process of comparing cutaneous distances. The total process contains five stages: a preparation and *Einstellung* of the observer; an estimating of the standard stimulus; a pause; an estimating of the comparative stimulus; and a formulating of the judgment. The preparation consists in a specific orienting and adjustment of the observer; when the signal is received he takes up a definite attitude toward the experiment, envisages the *Aufgabe*, and turns his attention in a particular direction. This is followed by a state of tension and expectation. During the progress of the experiments

this preparation-stage tends to become abbreviated and mechanized, but its influence is evident throughout. The second stage,—the estimating of the standard stimulus,—is characterized by an equally active but a distinctive process. Here again a definite *Aufgabe* is present, but it gives rise to a different procedure in different individuals. Certain observers attend especially to the sensory attributes of the stimulus and attempt to envisage it in schematic or symbolic form, while others fixate successively the terminal points of the standard distance and attempt to bring them into some sort of relation with one another. During the pause which ensues (third stage) the observer tends to turn back in memory to the standard stimulus and to look forward toward the comparative stimulus which is about to be presented, with a definite preparation and *Einstellung* for the act of comparing. The fourth stage,—the estimating of the comparative stimulus,—is of paramount significance; Gemelli here distinguishes four different degrees of facility of estimation and facility of apprehension of relation between standard and comparative stimulus. In the final stage the judgment is formulated and reported by the observer; and this stage, too, proves to be exceedingly complex, especially in the earlier stages of the experiment. Gemelli discusses the determining tendency of the *Aufgabe*, and its influence upon the disposition of the observer.

Rahn (43) points out that the static structural element is an artifact which owes its origin to a philosophical and unwarranted distinction between faculties of sense and of understanding. Psychologists have wrested sensation from its setting in experience, and then they have attempted to derive experience from it. The difficulty of this task has impelled certain recent writers to postulate imageless thought as a new structural component; but the advocates of this doctrine are quite as culpable as the sensationalists. The difficulty has been due to a failure to appreciate the fact that sensation as it really exists *in situ* is always under the domination of some purpose; sensation always functions, and it can not be understood apart from its functioning. The difficulty can be avoided only by revising the doctrine of sensation, and by recognizing that sensation is not an ultimate of stable character but is a development within the experience of an individual. The attributes of sensation do not appear in differentiated form until the individual reacts in discriminating fashion; and the ultimate for any individual experience is that to which the individual reacts. Structural

analysis is legitimate only if when we analyze an experience into its components we mean that the objective stimulation and the cortical excitation functioned as a unity in the experience in question, and functioned in such a way as to furnish that experience with the attitude of doubt or the unified perception or whatever other content was present in the experience. This being so, the added structural element is gratuitous.

Müller-Freienfels (**32**) describes three essential characteristics of perception: A selecting or accentuating of certain parts of a situation; a peculiar awareness of activity; and a typicalizing (in virtue of which the perceived content is apprehended not as an individual but as representative of a type or species). Each of these three characteristics is of motor and affective origin,—the selecting results from a motor reaction which in turn engenders feelings; the awareness of activity is analyzable into kinæsthesis and (as 'functional attention') it enlarges the perception, endows it with affective toning, with emphasis and with value; the synthetizing, generalizing and typicalizing is due not to association and assimilation but to feeling and to *Stellungnahme*. When a typicalizing perception is fixed by means of a name we have a concept,—as is shown by the fact that few can apprehend the typical when no name can readily be applied to designate it. The function of judging is already present in the act of perceiving; it is a formulating of the perception in words or gestures. The essence of judging consists in acting, which may, however, be either reflex (released by an *Affekt*) or volitional; and the concept is an automatic speech-reaction to a perception, which it serves to formulate.

Ribot's book (**45**) contains four re-published essays, two of which discuss the latent rôle of motor images and the problem of imageless and wordless thinking. The author holds that motor components of consciousness are relatively stable and resistant, and that they constitute the skeleton of consciousness. It is this skeleton or this motor residuum of affection and intellection which furnishes the unconscious substratum. Proceeding thence to a discussion of imageless thinking, Ribot points out that the hypothesis of a pure thought which is devoid of images and of words is neither probable nor has it been proven. Imageless thinking is to be regarded as an ideal limit which thought may approximate by successive rarefactions; if the limit were actually reached thought would be impossible. Imageless thought may be the product of an unconscious activity which involves residual motor processes.

Selz (51) employed the method of controlled association, with seven variations of *Aufgabe*, in an attempt to determine what factors direct the course of mental processes in thinking. His observers reported two sorts of content to which Selz attached chief importance: a sense of fluency of occurrence of stimulus-word; and a vague knowing of the relation demanded by the *Aufgabe*. (Knowing is an actual or dispositional consciousness of the specific relatedness of objects.) These two sorts of experience are to be regarded as the actualizing of a *Wissen*-disposition which was already present in the observer. The author's results emphasize the importance of 'direction' in thinking, and lead him to replace the constellation-theory of reproduction in orderly thinking by a theory of directed complex-integration (*determinierende Komplexergänzung*); this latter theory holds that the reproductive completion which takes place when a few terms of a complex are given is not due to constellation-units but to inherent complex-activity. The actualization of knowing which proved to be so significant in the solution of his experimental *Aufgaben* is to be regarded as a special case of complex-completion from an initially given portion of the complex with a knowing of the relation involved. And the completing of the complex is mediated by this consciousness of relation,—a consciousness which is unanalyzable and which is itself a schematic anticipation of the complex. The dispositional knowing whose actualization furnishes the solution is aroused by the *Aufgabe* and the awareness of the goal. This latter is describable as a searching in a determined direction, together with a consciousness of relation,—the latter furnishing the point of departure for progress in a specific direction.

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MEMORY, CONCEPT, JUDGMENT, LOGIC (THEORY)

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By insisting that in logic it is a waste of time to deal with inferences concerning particular cases, logic having to do throughout with completely general and formal implication, Russell (8) seems to remove logic from all psychological considerations, or at least from the province of actual thinking, if we assume that thinking is always specific, that it deals always with some particular case, whatever else it may be. Yet part of the importance of the book lies unquestionably in its psychology, in its belief in the practice of methodological doubt to break the dominion of habit, and in its demand that philosophic thinking shall limit itself on the side of what it may know and at the same time strive to develop fertility in imagining abstract hypotheses. The revolution in logic which the book signalizes is, in part, the recognition that the old logic of the classical tradition sought to legislate on the basis of a comparatively simple hypothesis as to what the world *is*, whereas the new logic aims to liberate the imagination as to what the world *may* be.

In place of the projected fourth volume of the work on "Thought and Things," Baldwin (1) has written an independent book as an outcome, or sequel, to his "Genetic Logic." Three types of logic

are distinguished, (1) the "logician's logic," which gives to logical principles an absolute and unconditioned value apart from the material of knowledge to which they may have application, (2) the "metaphysicians's logic," which conceives of logical principles as objectively existing, as reified, and (3) the "knower's logic," or genetic logic, which is developed from a more primitive, instinctive, emotional level, which marks a socialized form of concrete control, a community of interests, and which subsequently breaks from this partial and static level to undergo further development as the logic of fine art, answering to the cognitive and formal principle involved in beauty. Thus logic, but a logic of feeling, enters into the pancalism with which the genetic philosophy culminates.

Woodworth (11) offers a theory in explanation of "imageless thought," the basic idea of which is that "imageless thought" is an inner reaction to sensation, appearing as an image, not as an emphasis on the pattern or meaning residing in the given sensation, but "something new," not present in the sensation, but distinct from it, as the motor reaction is.

Dunlap (5), having observed that muscular contractions are regularly concomitant to the thought processes with which they occur, has framed the working hypothesis that muscular activity is involved in the condition of all thought, and the further and supplementary hypothesis that this form of present content (muscular activity) is that which is actually observed by those who report "mental images." He contends that the image as a copy, or reproduction, or pale ghost of former sensation does not exist. The content of thought or imagination actually present is in each case a muscle sensation, or a complex of muscle sensations. As a corollary, Dunlap holds that neither does "imageless thought" exist. The doctrine of the subconscious also receives a new interpretation. In many cases the muscular contractions themselves escape attention. This may be the general rule when we are thinking. The final arcs of the series may arouse consciousness and bring before it the result of unconscious reasoning or reflection. In every case, the muscle sensation is the true "image."

Müller-Freienfels (7) in a comprehensive review of recent tendencies in the study of memory is especially critical of the associational psychology involved, with its tendency to ignore important aspects and factors in memory, such as feeling, emotion, motor and constructive elements.

Lewis (6) has developed a new and more comprehensive calculus

of propositions, which he calls "the matrix algebra for implications," the consequences of which are believed to be important not only for logic but also for epistemology and metaphysics.

De Laguna (4) points out that the postulates of deductive logic stand upon a different footing from those of geometry. For deductive logic the *interpretation* of the symbols is prior to all else; hence, it is impossible for deductive logic to cut itself entirely loose from the external connections of common language and its consequent unclearness. The two postulates of the principle of deduction and the principle of substitution are discussed as illustrative cases.

Schweitzer (9) conceives of the logic of mathematics as essentially genetic, as the logic of a science of discovery, in the service of which working hypotheses are developed and made to function as instruments of discovery as in other genetic sciences. In support of this, itself a working and mediating hypothesis of comparison, Schweitzer draws upon a wide range of evidence, both from mathematical and philosophical sources.

Social aspects of conceptual thinking are discussed by three writers: Boodin (2) includes a treatment of conceptual interpretation, proceeding from James' functional psychology of the concept and of reasoning. But Boodin holds that James had not completely liberated himself from the old solipsistic psychology in making the concept the function of "private ends." Membership in a social community, participation in the discussion and exchange of experiences, as Plato realized in the dialogue, furnish indispensable conditions for the development of concepts, which in becoming science, as an institution, afford the clearest sort of illustration of division of labor consequent on coöperation in an interpretative task. Weeks (10) dwells on the meance to thought of socially centralized intelligence, "scientific" management, elaboration of details, complexities of life that make for simplicity of mind; and he emphasizes the importance of assuring to every individual insistent and varied problems as stimuli to the exercise of the higher processes of thought. Carlile (3) concludes that it is the concurrence of various individuals as regards information furnished by our senses which seems to be the main ground of the unquestioning acceptance by common sense of the belief in the external world. The recognition of this concurrence is possible only through intercourse, which is, therefore, the source of the most elementary and fundamental principle of our knowledge.

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VOCAL FUNCTIONS

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For the most notable contribution to the study of Vocal Functions made during the year 1914, we are indebted to Miles (11). He has answered the question as to just how accurately people can sing when they undertake to reproduce the pitch of a standard source of sound; and he has found how this accuracy varies with an approach to the limits of the voice's range, with changes in the intensity and in the timbre of the standard tone, with differences of volume of the voice, and with the use of varying vowel qualities. Only on this last point are Miles's results disconcerting. The researches of Berlage had not prepared us to learn that the higher the formant in a vowel clang, the higher that vowel is sung. Within a moderate range, high tones are sung relatively more accurately than the lower tones, as would be expected from what is known about pitch discrimination. Men and women sing in their respective ranges with equal accuracy as measured absolutely, in vibrations.

These and other generalizations are based upon forty thousand measurements made on two hundred adults. Only the use of Seashore's Tonoscope (**15**) would render feasible such an amassing of data and compilation of norms. Miles's paper ends with a set of recommendations regarding a standard test of the ability of the voice to reproduce pitch and to produce voluntarily small changes in pitch.

Although this year has produced no volumes on speech defects comparable with those of the immediately preceding years, good material is found in "An Experimental Study of Stuttering," by Fletcher (**6**). This student in the laboratory of Clark University brought to his investigation a better psychological training than Bleumel's, but his writing lacks an assurance born of extended research and practice with stutterers, which one expects from specialists like Gutzmann, Scripture, Froeschels, or Stevenson Smith. Fletcher's nine subjects were not trained in introspection; consequently he lays most stress upon that portion of his research which resorted to objective methods, pneumographic, plethysmographic, and galvanometric. Records of the physiological phenomena of stuttering exhibited typical incoördinations of breathing, voice, and articulatory mechanism. These, however, did not seem to reveal the essential features of the phenomenon, because instead of being uniform they were indefinite in character and exceedingly varied. The presence of certain states of mind, on the other hand, seemed to be constant accompaniments of stuttering, and lead the experimenter to a study of these topics: emotions of anxiety, lack of confidence, and so on; "attitudes" of awareness of one's audience, or of expectation of stuttering; absence of clear anticipatory images of necessary speech movements; inordinate concentration of attention upon the speech act; the "aufgabe" consciousness of the stutterer, the realization of his responsibility for speaking; and finally, the share of associative mechanisms in causing the stutterer's inhibitions. The evidence which the author adduces in connection with this psychological portion of his study is largely anecdotal rather than experimental.

Morrison's (**12**) study of the speech defects of children in the kindergarten and first year of the primary school reminds the reader how frequent are the connections between speech defects and remediable physical defects. It also shows that vast improvement can sometimes result from even a little speech training when it is resorted to at this early stage of school life.

The amassing of children's vocabularies goes on apace, particularly here in America (**1**, **2**, **3**, **4**, **17**). In Norway, Eng (**5**) resorts to association reactions to learn the nature and prevalence of the abstract and general concepts with which school children's minds are stocked. In Hamburg and Berlin, the phoneticians continue to pursue elusive laws of intonation (**14**, **18**) and of clang character (**8**, **13**). Echoes of the Rutzian controversy persist (**7**, **16**). From many fascinating contributions to *Vox*, one written by a teacher of the deaf and dumb is selected for mention in concluding this review. Lindner (**10**) found it most difficult to train his pupils to the correct use of the s-sound, ubiquitous in German speech, until he hit upon the idea of making the sibilant visible to the deaf speaker by means of the sensitive flame, familiar to the physics lecture table. The flame burns straight and tall except when the air is aquiver with a hiss; then it promptly foreshortens.

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SPECIAL REVIEWS

Physical Growth and School Progress. A Study in Experimental Education. B. T. BALDWIN. Washington: Govt. Print. Of., 1914. Pp. 212. (U. S. Bur. of Educ. Bull., 1914, no. 10. Whole Number 581.)

Within the first two years after birth the number of cells forming the human body reaches or nearly reaches the limit characteristic for the species, and later growth becomes a matter of cell enlargement mainly. It is with this second phase of growth that Baldwin is dealing, his records being for children four to eighteen years of age. This fact should be kept in mind in making an interpretation of the results.

The problems treated are the form and variation of the individual growth records for height, weight and lung capacity; the occurrence of retardation, precocity and departure from type in growth and the relation of these variations to school work as shown by school records.

In addition to the treatment that such data necessarily demand, there is given an interesting historical outline on the rise of physical measurements, with a summary of the main conclusions, and also a good annotated bibliography, comprising three hundred and thirty six titles. The peculiar value of this contribution lies in the fact that by dint of persistent industry the author has gathered, tabulated and collated data from the records of the elementary and high schools of the University of Chicago, from the Francis W. Parker School of Chicago and from the Horace Mann School of the Teachers College of Columbia University, and has thereby obtained an unusual series of measurements in which the observations apply to the same individual at successive ages. Data of this sort have been much desired for, with the exception of a few rather limited series presented by Wiener, Camerer, Peckham and one or two others, such data have not been available until the publication of these extensive tables by Baldwin. As always happens the new data permit the handling of questions previously more or less out of reach and Baldwin has made use of the opportunity thus offered.

Touching the material used, it is to be recognized at the start that children in all of the schools mentioned belong to a social group living under distinctly favorable conditions and it is therefore not surprising that the values for the physical characters run above those obtained by other students of American children who included less favored groups in their series. It follows of course that the status of any individual in respect to a given character must be determined by reference to the mean of the group to which he belongs and not to that of some other group.

Following this method Baldwin finds for both boys and girls that those above the median in height, weight and lung capacity enter on the phase of accelerated growth earlier and reach the period of arrest sooner, than do those below the median. Thus the physiological maturity of the larger children is attained earlier than that of the smaller. Moreover in girls the age of the first menstruation is closely correlated with the general physical development, appearing earlier in those girls in which this development is more advanced. It follows therefore that the wide range in age (11–16 yrs.) at which the first menstruation takes place does not represent a fluctuation in the appearance of this function in girls of the same physical development but a variation closely connected with the rate of that development.

Further, the graphs for height and weight show that within the ages studied (6½–18 yrs.) the individual tends to maintain his relative position. Thus those above the median in their early years tend to remain above the median and vice-versa. Such arrests of growth as occur are most marked in the adolescent period, and though the common diseases of childhood do not have any permanent influence, adenoids do retard growth.

In addition to the physical data from which the foregoing conclusions have been drawn Baldwin has determined the average school-marks for forty-two boys and forty-six girls from the Horace Mann School and for twenty-six boys and twenty-one girls from the Francis W. Parker School, a total of one hundred and thirty-five individuals for each one of which the physical measurements are also at hand.

A number of interesting relations appears when these two sets of data are collated. In the first place in the elementary grades the average marks for the girls are above those of the boys in both schools and in every grade, without exception. Further among both boys and girls those of the normal school age or younger

maintain a better school standing both as to grade and mark than those over age for grade.

The explanation of this lies in the advanced maturity of the more successful pupils for those whose physiological age is accelerated complete the last grade of the elementary school at twelve years, nine and five-sixths months with an average mark of 84.35 while those retarded in physiological development do not complete the work until they are thirteen years, seven and four-thirteenths months of age and with an average mark of 81.72.

This conclusion is in accord with those of Porter, Christopher and Gratsianoff, but in connection with it the opportunities for misinterpretation are numerous and the author warns against confusing brightness or precocity with stages of mental maturity.

Why accelerated growth and success in school work should be thus correlated has yet to be explained. Since unfavorable conditions retard growth in both man and animals, it may be inferred that the acceleration in question indicates distinctly favorable conditions while at the same time it is to be remembered that the vigor of the organism is also a variable factor.

The children here studied are given their position in the group at an early age (before 6½ yrs.) and generally maintain this position during the entire period of observation.

The problem of the large and small child with its consequences arises therefore early in life, although even at that time cell enlargement has become the main method of growth.

What the impulse to cell enlargement is we do not know, though the studies of Osborne and Mendel show that under special conditions diets with certain definite chemical deficiences may retard or arrest growth or even cause a loss in weight, the normal growth process being resumed when the particular deficiency in the diet is made good. On the other hand we may fairly assume individual differences in the efficiency of the organism which make one individual able to utilize a given diet better than another does, and thus grow more generously.

At present a more precise explanation is hardly warranted. While it is beyond question that hormones from the gonads modify the activities of the nervous system during adolescence there is no reason to regard the accelerated growth of the body at adolescence as a consequence of the development of the gonads. Within the age limits here taken, school standing as represented by grades may be considered as an index of those changes in the nervous

system which accompany the maturing process. Moreover the same conditions which favor growth also favor a smooth running of the mechanism which in turn finds expression in school marks.

The interesting difference between boys and girls in the matter of school marks invites a word in this connection. This difference is probably the result of several influences and conditions, in part social but in the main represented by the general precocity of the female during this period of her development.

Baldwin has not only presented his data in a way to make them useful to others but has used them so as to draw conclusions on a number of questions touching the growth of children. Among these questions by far the most important are the relation of the period of acceleration to physical growth and the positive correlation between height and weight, as indices of physiological maturity, and school standing, and the importance of his conclusions on these points depends on the fact that they are based on this valuable and unique series of individual records.

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COMMUNICATION

In the latter part of April I sent a set of questions on terminology to approximately 120 American psychologists. I made up the list by including all members of the American Psychological Association whose professional degrees are dated 1902 or earlier, and adding several names of those who, although not having a professional degree, legitimately belong in the group to be considered. The chronological method of selecting the group seemed to me the least open to objections, for persons who have been teaching or discussing psychology for twelve years or more may reasonably be expected to have emerged somewhat from the influence of their teachers and to have developed definite notions as to the significance of the terms they use.

I requested replies by May 15, as I hoped to compile the results during the summer months. A large proportion of those addressed have replied, and it is clear that the results of the questionary are to be very important. Returns have been coming in rather slowly, however, and it seems advisable to defer the compilation until fall. I request, therefore, that those who have not sent their replies will do so as early as possible, in order that the compilers' labor (which will be heavy) may be completed before the Christmas meeting.

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NOTES AND NEWS

THE August number of the BULLETIN, dealing with comparative psychology, was prepared under the editorial direction of Professor W. S. Hunter, of the University of Texas.

DR. H. S. LANGFELD, of Harvard University, has been promoted to the grade of assistant professor.

THE Board of Trustees of George Peabody College for Teachers has announced the gift of $8,500 from Miss Eleanor Cuyler and Mr. Thomas De Witt Cuyler to be expended for furniture, equipment and publications for the psychological laboratory.

A LIST of members of the teaching and scientific staffs of universities, technical schools, etc., of the United Kingdom with the British army is given in a recent number of *Nature*. Among those who are thus engaged are C. S. Myers, lecturer in experimental psychology in the University of Cambridge; G. H. Turnbull, assistant lecturer in education in the University of Liverpool; W. Brown, reader in psychology in King's College, London; F. Aveling, lecturer in synthetic psychology, and C. Spearman, professor of philosophy of mind and logic in University College, London.

ARRANGEMENTS are being made for the Second Pan American Scientific Congress to be held in Washington, December 27, 1915, to January 8, 1916. Membership is limited to representatives of governments, universities, scientific societies and bodies, and to other specially invited guests. It is understood that a general invitation to participate will be extended to members of the American Association for the Advancement of Science. Psychologists will be interested in sessions of Section I (Anthropology), Section IV (Education), and Section VIII (Public Health and Medical Science). Information regarding promised psychological papers will be given later, but it is expected that they will be mainly those relating to mental hygiene and to abnormal psychology.